

## CLAIMS

WE CLAIM:

1. A hand held pointing device for a computer system or the like, the pointing device comprising:
  - 4 a housing having a flat bottom surface that moves against a work surface having imageable features;
  - 6 the housing also having a top surface shaped to receive that human hand;
  - 8 the housing also having a skirt connecting a perimeter of the flat bottom with the top surface;
  - 10 the housing having a first axis extending generally in the direction from where the heel of the hand rests on the top surface to where the middle finger rest on the top surface, and a second axis perpendicular to the first, both axes being parallel to the bottom surface;
  - 12 an aperture in the bottom surface;
  - 14 a source of illumination mounted within the interior of the housing, proximate the aperture and that illuminates imageable features on the work surface;
  - 16 an optical motion detection circuit mounted within the interior of the housing and proximate the aperture, the motion detection circuit producing motion indication signals indicative of motion in the directions along the first and second axes and relative to illuminated imageable features visible through the aperture; and
  - 18 wherein the optical motion detection circuit comprises a plurality of photo detectors each having an output, a memory containing a reference frame of digitized photo detector output values and a sample frame of digitized photo detector output values obtained subsequent to the reference frame, and further wherein a plurality of comparison frames, each being a shifted version of the reference frame, is correlated with the sample frame to ascertain motion in the directions along the first and second axes.
2. A device as in claim 1 wherein the an existing reference frame is shifted by an amount  
2 corresponding to the preceding correlation with a comparison frame.

3. A device as in claim 1 wherein an existing sample frame is periodically taken as a new reference frame.

4. A hand held pointing device for a computer system or the like, the pointing device comprising:  
a housing having a flat bottom surface that moves against a work surface having imageable features;

the housing also having a top surface shaped to receive that human hand;

the housing also having a skirt connecting a perimeter of the flat bottom with the top surface;

the housing having a first axis extending generally in the direction from where the heel of the hand rests on the top surface to where the middle finger rest on the top surface, and a second axis perpendicular to the first, both axes being parallel to the bottom surface;

an aperture in the bottom surface;

a source of illumination mounted within the interior of the housing, proximate the aperture and that illuminates imageable features on the work surface;

an optical motion detection circuit mounted within the interior of the housing and proximate the aperture, the motion detection circuit producing motion indication signals indicative of motion in the directions along the first and second axes and relative to illuminated imageable features visible through the aperture; and

a proximity detector that detects when the bottom surface is away from the work surface by more than a selected distance, that is coupled to the optical motion detection circuit, and that inhibits the production of the motion indication signals when the bottom surface is away from the work surface by more than the selected distance.

5. A device as in claim 4 wherein the proximity detector comprises at least one switch disposed on the skirt in a location underneath the right thumb or the left ring finger of a hand grasping the pointing device.

6. A device as in claim 4 wherein the proximity detector comprises at least one switch disposed on the skirt in a location underneath the left thumb or the right ring finger of a hand grasping the pointing device.

7. A device as in claim 4 wherein the optical motion detection circuit comprises a plurality of photo detectors each having an output, a memory containing digitized photo detector output values and the proximity detector comprises arithmetic comparison circuits coupled to the digitized values in the memory.

8. A device as in claim 4 wherein the proximity detector comprises a pressure actuated switch disposed proximate the bottom surface.

9. A device as in claim 4 wherein the optical motion detection circuit comprises a plurality of photo detectors each having an output, a memory containing a reference frame of digitized photo detector output values and a comparison frame of digitized photo detector output values obtained subsequent to the reference frame, and wherein a new reference frame and subsequent comparison frame are obtained at the conclusion of an inhibition of the production of motion indication signals and prior to a resumption of the production of motion indication signals.

10. A device as in claim 9 wherein the new reference frame is obtained after a delay of a selected amount beyond the point in time when the proximity detector no longer detects that the bottom surface is away from the work surface by the selected distance.

11. A hand held pointing device for a computer system or the like, the pointing device comprising:  
a housing having a flat bottom surface that moves against a work surface having imageable features;  
the housing also having a top surface shaped to receive that human hand;  
the housing also having a skirt connecting a perimeter of the flat bottom with the top surface;  
the housing having a first axis extending generally in the direction from where the heel of the hand rests on the top surface to where the middle finger rest on the top surface, and a second axis perpendicular to the first, both axes being parallel to the bottom surface;  
an aperture in the bottom surface;  
a source of illumination mounted within the interior of the housing, proximate the aperture and that illuminates imageable features on the work surface;  
an optical motion detection circuit mounted within the interior of the housing and proximate the aperture, the motion detection circuit producing motion indication signals indicative of motion in the directions along the first and second axes and relative to illuminated imageable features visible through the aperture; and  
a detector, coupled to the motion detection circuit, that detects when the motion of the pointing device within a time interval exceeds a selected limit, and that in response inhibits the production of the motion indication signals.

12. A device as in claim 11 wherein the optical motion detection circuit comprises a plurality of photo detectors each having an output, a memory containing a reference frame of digitized photo detector output values and a comparison frame of digitized photo detector output values obtained subsequent to the reference frame, and wherein a new reference frame and subsequent comparison frame are obtained subsequent to when the detector no longer detects that the motion of the pointing device exceeds the selected limit and prior to a resumption of the production of motion indication signals.